BOEING

INSTRUCTION BOOK

for

Model 8890 TERMALINE

Coaxial Load Resistor

# BIRD

## INSTRUCTION BOOK

MP MASTER

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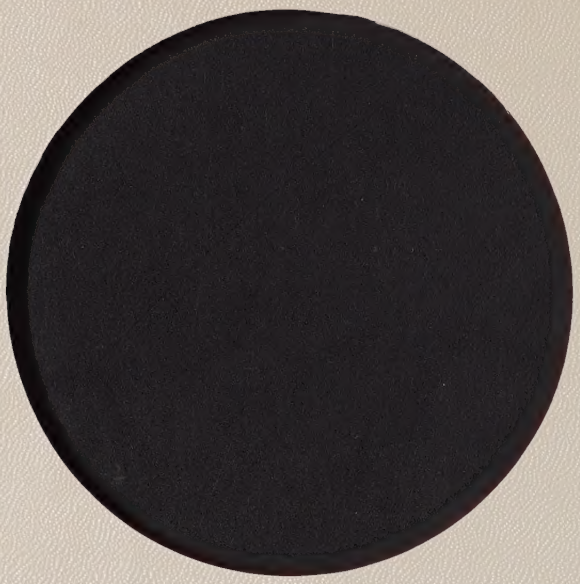

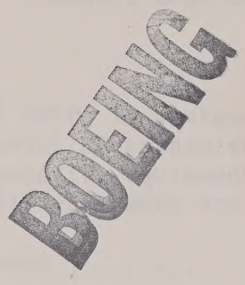


# INSTRUCTION BOOK

for

Model 8890 TERMALINE

Coaxial Load Resistor

# Instructions
for
INSTALLATION-OPERATION-MAINTENANCE
Model 8890 TERMALINE
Coaxial Load Resistor

## GENERAL DESCRIPTION

The RF Dummy Load, Model 8890, is designed as a low-reflection and non-radiating termination for coaxial RF transmission lines, to assist in tuning and trouble-shooting of transmitting equipment within its rating. Electrical specifications applying to this equipment are as follows:

| | |
|---|---|
| Characteristic Impedance | 50 ohms, nominal. |
| Power Input | 2500 watts average continuous. |
| Frequency Range | DC to 1000 mcs. |
| VSW Ratio | 1.1 to 1.0 max. |
| Input Connector | Normally supplied in Female LC Bird "QC" Type connector. Most AN types available on order. |

It may be used in a fixed position or in portable applications.

The Model 8890 RF Load is a self-contained apparatus. No additional equipment or outside power source is needed. The load unit is rectangular in shape with transverse cooling fins spaced evenly along the entire length. Reinforced fins at front and rear are bent outward 90° at the bottom to form mounting flanges. These flanges act as supports for free standing use, or as mounting brackets for optional fixed mounting. Mounting holes are provided for this purpose. The rf input connector is located on the front face of the unit. This is of special Quick-Change design, see Installation Section. The Load Unit is filled with specially selected high temperature dielectric coolant, and vented at the top with a shrouded pressure-relief valve. The Model 8890 is useful for the following purposes:

a. As a substitute antenna.
   (1) For tuning transmitters - under non-radiating conditions.
   (2) For making routine tests and adjustments.

b. As a substitute for any circuit loading element.

c. To measure, with a suitable indicating device, the power output of coaxially transmitted power within its rating.

## THEORY OF OPERATION

The Model 8890 equipment consists essentially of a carbon film-on-ceramic resistor immersed in a dielectric coolant. The resistor, individually selected for its accuracy, is enclosed in an exponentially tapered housing. This provides a linear reduction in surge impedance, directly proportional to the distance along the resistor. When surrounded by the dielectric coolant, the characteristic impedance is therefore 50.0 ohms at the front (connector end) and 25.0 ohms halfway down, to compensate for resistance already passed over. It is zero ohms at the rear, where the resistor joins the housing, forming the return conductor of the coaxial circuit. This produces the uniform, practically reflectionless line termination

over the stated frequencies of the load resistor.

The dielectric coolant, Monsanto OS-59, is chosen for chemical inactivity (to prevent damage to the resistor), high flash point, and its low dielectric constant, to which the diameters of the resistor housing are matched.

A synthetic rubber O-ring around the outside of the resistor housing mount furnishes a seal for the radiator opening. A beveled flange retains the O-ring. This flange, with the O-ring between, is pressed against the radiator face by the resultant action of the drawing up of the radial V-band clamp around opposing beveled flanges of the radiator and the resistor housing.

When input power is applied, the resistor generates heat in the adjacent dielectric coolant. By convection, the heated oil flows through slotted openings in the coaxial shell to the walls of the fabricated metal tank. The series of radiating fins brazed to the tank transmit the heat of the dielectric coolant into the surrounding air.

When the Coolant Oil E-702 (Monsanto OS-59) is heated, thermal expansion causes an increase in internal pressure. A vent plug is provided for use in the filler socket to prevent possible pressure buildup. This plug very thoroughly shields the filler opening, while allowing free vent relief from the coolant tank, see INSTALLATION paragraph below.

INSTALLATION

RF Dummy Load, Model 8890, is equipped for either fixed installation or portable use. Mounting brackets are secured to the front and rear faces of the unit. The unit may stand free or be secured to a bench, etc. by means of four suitable fasteners. Four 3/8" holes, for use with screws up to 5/16" diameter, are arranged in a 5-3/8" x 21-1/4" rectangle. The load is designed for operation in a horizontal plane only, with mounting brackets down. NOTE: DO NOT OPERATE IN ANY OTHER MANNER.

CAUTION

Shipping plug 0-706 must be removed and replaced by vent plug 0-705 before the unit is placed in operation. Failure to do this could result in damage to equipment and damage to safety. The vent plug is attached to the filler socket by a small length of bead chain. This chain should remain fastened, and will prevent possible misplacement of the part. The vent is readily installed or removed from the filler socket with the chain in place. Shipping plug should be replaced whenever the unit is to be shipped. Note respective O-ring on these plugs which must be used when each is screwed in place - do not interchange rings.

OPERATION

Connect the Model 8890 to the power source under test by means of a suitable (such as RG-177/U, RG-220/U, RG-221/U) coaxial power cable. Check that all coaxial power line connections are properly tightened. Proceed according to instructions pertaining to specific equipment involved.

MAINTENANCE

The Model 8890 is rugged and simple and should require only nominal routine care. It is designed to operate for long periods of time if care is taken not to exceed its power handling capabilities.

The outside surface of the instrument should be wiped free of dust and dirt when necessary. Clean the rf input connector J-701 with Inhibisol* or its equivalent, or trichlorethylene, on a cotton swab stick. Take special care to clean the metallic contact surface and the exposed face of the teflon insulator. Provide adequate ventilation and observe other normal precautions when using solvents.

LOAD RESISTOR, E-701

Accurate measurement of the dc resistance between the inner and outer conductors of the input coupling will provide a good check of the condition of the load resistor, E-701. For this purpose, use a Resistance Bridge with an accuracy of one percent or better at 50 ohms such as Leeds & Northrup Model 5305 Test Set. Use low resistance leads, preferably a short piece of suitable cable attached to an appropriate plug. When the resistor is checked at room temperature, the measured resistance should be within one ohm of the value inscribed for RDC at bottom of blue test ticket attached to the load. If the value obtained materially exceeds this allowance, the load resistor should be replaced.

To change the load resistor assembly E-701, place the unit on its back end (connector up) and loosen the #10-32 x 1-1/2 screw on the clamping band, 0-702. Remove the clamping band, and lift load resistor assembly out of the tank - be careful to allow coolant to drip back into the tank. This unit is not subject to further disassembly by field maintenance, and a defective unit should be replaced in its entirety. Before replacing a load resistor, be sure that the O-ring seal 0-701 is in proper place and in good condition. It should be free of twists and positioned evenly all around the beveled flange of the resistor housing.

To replace housing assembly E-701, reverse procedure described in paragraph above.

COOLANT, E-702

The level of the dielectric coolant E-702 should remain constant in the unit after prolonged usage under normal operating conditions. Inspect occasionally around lower portion of the clamping band 0-702 for possibility of coolant leakage. Tighten clamping screw if required. Under very unusual conditions it might be necessary to replace the resistor housing seal O-ring 0-701. Proceed as described in paragraph above.

* A non-toxic, non-flammable dry cleaning agent manufactured by the Penetone Co., Tenafly, New Jersey.

To check the coolant level, remove vent plug 0-705 from the filler socket on the top surface of the unit. Unscrew the plug with a 3/4-inch wrench. Coolant level should be within 3 to 3-1/4 inches below the top surface of the filler socket. The unit is factory-filled to the proper level with 1.7 gallons of Monsanto OS-59. NO OTHER COOLANT MAY BE USED.

OVERLOAD THERMOSWITCH, E-703

As an optional item, a thermoswitch may be provided for protection against overloading of the load resistor. The front face of the radiator unit has a 3/4-14 tapered pipe thread hole in the upper center (closed with a hex socket pipe plug). When ordered, the Thermoswitch Assy #889008 is screwed into this threaded hole instead.

Where the Model 8890 TERMALINE Load Resistor was originally received without the Thermoswitch, proceed as follows to make fittings:-

Tilt unit up at front end and stand radiator with front straight up (coolant will not contact the vent hole if radiator is handled this way). Using a 9/16-hex socket wrench, remove pipe plug from face of radiator.

Taking Connector Assy #245018 by knurled flange nut adjacent to the thermoswitch head, unscrew nut and remove connector assy from Thermoswitch #889005. Apply Quigley's (or equivalent) pipe seal compound to the threads of the thermoswitch body and unscrew into radiator socket. Tighten with 1-1/8 flat wrench.

Unscrew cable clamp portion from back end of Connector Assy #245018. Thread transmitter interlock leads through cable clamp, and solder to lugs inside the connector plug. Reassemble the cable clamp, and screw assembly onto jack of thermoswitch.

Rise of coolant temperature above 235°C will open thermoswitch contacts. This cuts off rf power to load resistor when leads are series coupled to the transmitter interlock.

RF INPUT CONNECTOR, J-701

The input connector is of special quick-change (QC) design permitting facile interchange of connector with only simple tools. This process does not in anyway disturb the coolant seal or interfere with the essential coaxial continuity of the load resistor rf input.

If replacement of the rf input connector J-701 is needed, proceed as follows:

(1) Remove the four #8-32 x 5/16 round head machine screws from the corners of the rf connector.

(2) Pull connector straight out.

(3) Reverse above procedure to install new connector, making certain that the projecting center contact pin of the QC connector is carefully engaged and properly aligned with the mating socket of the load resistor.

The QC connector may be readily replaced, as above, with other AN Standard Type connectors if specially obtained. Available types are listed below.

| | | | |
|---|---|---|---|
| N - Female | 424062 | LC - Female | 424031 |
| N - Male | 424063 | LC - Male | 424025 |
| HN - Female | 424073 | LT - Female | 424018 |
| HN - Male | 424049 | LT - Male | 424012 |
| C - Female | 424100 | UHF - Female (SO-239) | 424050 |
| C - Male | 424110 | UHF - Male (PL-259A) | 424179 |

7/8" EIA Airline 424002

TABLE OF REPLACEABLE PARTS

| SYMBOL | NAME AND DESCRIPTION | LOCATING FUNCTION |
|---|---|---|
| A-701 | RADIATOR, Cooling: Rectangular shape, 22-1/4 lg x 10-3/4h x 6-3/8w. Transverse vertical fins brazed at 1/2-inch intervals to central tank; integral construction. 4 in. dia opening at front, filler hole at top, with foot brackets front and back. Al. alloy. Gray enamel. Bird Electronic Corp. part/dwg. #245003. | Houses rf load resistor assembly and dielectric coolant. |
| E-701 | LOAD RESISTOR, RF: Tapered and slotted coaxial line with 50-ohm load resistor center conductor. 4-1/2 dia. x 13-1/2 lg. Copper alloy. Bird Electronic Corp. part/dwg. #889002. | Housed in radiator A-701 non-reflecting terminator for rf power. |
| E-702 | COOLANT: Dielectric fluid - Monsanto OS-59 Bird Electronic Corp. part/dwg. #5267. | Dielectric coolant. |
| J-701 | CONNECTOR, RF Input: Female type LC, post shape 2 in. lg. with 1-1/4 in. square mounting flange. Four 3/16 in. mounting holes on 15/16 in. square. 1-1/4 x 18 threads per inch. Brass, silver plate. Bird Electronic Corp. part/dwg. #424031. | Input connector - Female LC Type normally supplied. |
| O-701 | O-RING, Seal: 4 x 4-1/4 x 1/8 nominal. Synthetic rubber (black) Viton A, Linear #11-242. Bird Electronic Corp. part/dwg. #5230. | Seal against coolant leakage around edge of rf sub-assembly. |
| O-702 | CLAMPING BAND: 4-5/8 O.D. x 1/4 V-band with two clamping blocks (one threaded) and 10-32 x 1-1/2 Fil. Hd. M.S. Stainless steel, gray nickel plate. Bird Electronic Corp. part/dwg. #24355. | Holds load resistor E-701 to radiator A-701. |
| O-704 | O-RING, Seal: 7/16 x 1/16 nominal. Synthetic rubber (black) Viton A, Linear #11-013. Bird Electronic Corp. part/dwg. #5244. | Seals coolant vent valve assy O-705. |

TABLE OF REPLACEABLE PARTS
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| SYMBOL | NAME AND DESCRIPTION | LOCATING FUNCTION |
|---|---|---|
| 0-705 | VALVE, Vent: 3/4 hex - 9/16 x 18 threads. 1-1/8 inch overall lg. Hooded top, captive chain anchor. Brass, gray nickel plate. Bird Electronic Corp. part/dwg. #24381. | Vapor pressure relief. |
| 0-706 | PLUG, Shipping: 3/4 hex, 1/2 in. overall 9/16 x 18 thread. Brass, gray nickel plate. Bird Electronic Corp. part/dwg. #245049. | Replaces 0-705 for Shipping purposes. |
| E-703* | THERMOSWITCH, Overload: 1-1/8 Hex Plug, 5/8d Body, 9 lg overall. Brass, N.Plate Bird Electronic Corp. part/dwg. #889008. Includes Body #889005 and Conn. Assy #245018. | Transmitter interlock - Cuts-off at 236°C. |

* Optional equipment, provided only when specially ordered.

Bird Electronic Corp.
Cleveland, Ohio

MP MASTER
MA34308

BIRD ELECTRONIC CORPORATION
30303 Aurora Road - Cleveland 39,
(Solon) Ohio - Phone CHurchill 8-1200

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